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Improving communication strategies for vulnerable populations during health crises: Learnings from COVID-19 Knowledge, Attitudes and Practices in an informal settlement in Mumbai, India

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## Abstract

The COVID-19 pandemic provided lessons for health policies across the globe. We assessed the knowledge, attitudes and practices of vulnerable populations in an informal settlement in Mumbai, India, during the pandemic. We discuss the viability and effectiveness of communication strategies using the results and provide suggestions for policy modifications regarding awareness generation and behavioral change during health emergencies. The study was conducted through a telephone survey among 460 men and women from April to May 2021.

Television (94%) and family (70%) were the most common sources of information but they were not the most trusted. Most respondents knew the causes and preventive measures of COVID-19, including vaccination. However, awareness did not always result in changes in attitudes and behaviour- 66% perceived low/no risk to COVID-19, while 70% did not consider it essential to wear masks in markets/workspaces or sanitize hands before/after leaving workspaces/home. More respondents had fears related to loss of employment (53%) than their physical (10%) or mental (4%) health.

The study highlights the need for context-specific communication strategies among vulnerable populations. This includes reliable and accessible sources of information, an emphasis on information accuracy and detail, and a holistic and multidimensional approach to awareness and information sharing.

Keywords: COVID-19; knowledge, attitudes and practices; health communication; slums; Mumbai



### Introduction

The COVID-19 pandemic provided crucial lessons for health policies across the globe. With the onset of the COVID-19 pandemic and national lockdowns in 2020, attention was directed towards understanding knowledge, attitudes, and practices (KAP) related to COVID-19. KAP was considered especially important to study among vulnerable populations due to the high density of population (Kuang et al., 2020), illiteracy (Kaushik et al., 2021), vulnerability to misinformation (Kadam & Atre, 2020), unequal access to basic necessities such as water and sanitation (Kartheek et al., 2020; Kaushal & Mahajan, 2021), and inadequate public healthcare systems (Kuang et al., 2020).

Studies in India have highlighted various aspects of KAP during COVID-19, such as low awareness of asymptomatic spread (Gupta et al., 2020), fear of economic loss (Kuang et al., 2020), traditional practices for prevention (Tomar et al., 2021), among others. It has been found that information sources, awareness and attitudes varied based on socioeconomic and demographic characteristics like age, gender, education attainment (Abuhashesh et al., 2021; Austrian et al., 2020; Williams et al., 2021), area of residence (Singh & Ahuja, 2020), employment status and income (Alahdal et al., 2020; Defar et al., 2021).

Health communication played a significant role in generating awareness, directing attitudes and instilling preventive behaviours across the globe during the COVID-19 pandemic (Finset et al., 2020). Throughout this time, mass media, encompassing social media, played a pivotal role in accelerating and disseminating information (Kuang et al., 2020; Qalati et al., 2021). Studies conducted in India report that television was a primary medium for receiving information, followed by social media (Ayedee & Manocha, 2020; Kaushik et al., 2021; Williams et al., 2021). Studies have cautioned about the use of social media during the pandemic due to the spread of misinformation, bias and fear (Alahdal et al., 2020; Depoux et al., 2020; Kadam & Atre, 2020) while some also highlighted the heterogeneity of misrepresentation through different platforms of social media (Meppelink et al., 2022). Social media use also differed based on socioeconomic characteristics like age and gender (Abuhashesh et al., 2021). Along with dissemination through mass media, interpersonal communication (IPC) through health workers and public-private partnerships, such as with non-governmental organizations (Mirchandani & Chitrapu, 2023) was used for awareness and behavior change. Authors such as Huang et al. (2023) corroborate the use of multiple sources of information during the pandemic as causing information overload. Studies in different settings



suggest the need for customization of health communication based on socioeconomic and demographic characteristics of the community (Cooks et al., 2022; Karidakis et al., 2022; Matsunaga et al., 2023).

An understanding of how and which health communication strategies were useful in improving KAP during the pandemic, specifically among vulnerable populations in urban informal settlements, is limited (Austrian et al., 2020; Okem et al., 2022). Implementing health communication strategies in inadequate housing settlements or slums of cities gains greater importance in tackling health crises due to vulnerabilities associated with high density, poverty, and lack of adequate health facilities and other basic services. Various studies show how communication uptake differed in these settings. Though television and social media continued to be primary sources of information in slums, they were less trusted than healthcare providers and workers (Austrian et al., 2020; Islam et al., 2020; Palwe & Bajaj, 2021). The use of specially curated mobile applications for COVID-19 awareness and information were limited in these settings (Gupta et al., 2020). The practice of preventive measures such as social distancing or regular hand washing were also a challenge for dense slum settlements (Austrian et al., 2020; Wilkinson et al., 2020).

Through an analysis of knowledge, attitudes and practices in a slum settlement in Mumbai city during the second wave of the COVID-19 pandemic, the current study aims to discuss the viability and effectiveness of communication strategies for awareness generation and behavioral change in vulnerable settlements during health emergencies. It aims to explore the sources of information, nature of information needs, fears and perceptions of the community during the pandemic, their awareness of COVID-19-related symptoms and preventive measures, and corresponding practices and behavioral changes adopted. It also compares the results of two surveys conducted at different times during the pandemic. Through this, the study aims to learn from experiences during the pandemic to provide suggestions on communication strategies and interventions for future health emergencies/crises that can be best suited to raise awareness and promote healthy behaviors in socio-economically vulnerable settings such as slum settlements.



### Methods

#### Study setting

The study was conducted in Dharavi, Mumbai, India. Dharavi is one of Asia's biggest urban informal settlements, covering an area of 2.4 km<sup>2</sup> (Ramani et al., 2022). It is one of the densest slum settlements in Mumbai, with an estimated population of one million residents (World Population Review 2023). It is estimated to house thousands of small-scale manufacturing units, including leather, textiles, recycling, pottery and food, leading to a considerable number of seasonal migrants working here (Patel et al., 2010). Dharavi emerged as a COVID-19 hotspot in April 2020, and cases peaked in May 2020 (1402 cases, 101 deaths), tapered by March 2021 and the cases increased to 1531 in April 2021, during the survey period (Ramani et al., 2022). Dharavi gained attention during the pandemic due to its model of preventing and tackling the disease using the "4T's" – tracing, tracking, testing, and treating. This was done using community involvement and public-private partnerships (Mirchandani & Chitrapu, 2023). Dharavi's ability to control the pandemic spread, despite inadequate, dense housing and poor basic services in the first wave, came to be adopted as a model for tackling COVID-19 in slums and was replicated in other parts of the country and beyond (Kaushal & Mahajan, 2021; Kudtarkar, 2021).

In Dharavi, SNEHA, a non-governmental organization established in 1999, implements various programs for improving maternal and child health, adolescent health and prevention of violence against women and children. During the pandemic, SNEHA's Mission Dharavi Project aimed to support residents in Dharavi with necessary credible and up-to-date information on COVID-19, including preventive measures to be taken, testing facilities and provision, and information on quarantine centers and hospitals (Ramani et al., 2021). The project also supported the health authorities in disseminating information in the community and identifying and referring cases to appropriate facilities in Dharavi. As part of this initiative, two surveys (September-October 2020 and April-May 2021) were conducted in Dharavi to assess COVID-19 perceptions, knowledge and preventive practices. Ethical approval for the study was obtained from the Institutional Ethics Committee of Bandra Holy Family Medical Research Society, Mumbai.



### Data collection and participants

Two cross-sectional surveys were conducted between September-October 2020 and April-May 2021 to assess the level of COVID-19 awareness and preventive practices in the community. The participants were selected from a sampling universe of 15,000 households with an estimated population of 75,000 in three administrative divisions of Dharavi. The inclusion criteria were an adult (18 years and older) living in these households. A total of 6100 phone numbers were gathered from two sources: frontline health workers of the Integrated Child Development Services, a national child health and nutrition community-based program that caters to vulnerable populations and community volunteers associated with SNEHA. A random sample of households (in MS Excel) was drawn from the list of phone numbers of the households. For households with more than one contact number, one number was randomly selected for inclusion in the sampling frame. We estimated a sample size of 382 for the survey (+/-5% confidence interval calculation from a conservative 50% prevalence estimate). Using a 15% non-response rate for refusals and erroneous data (based on earlier surveys in the area), the final sample size required was 450.

Data were collected through structured interviews via phone due to COVID-19-related restrictions on movement by the Government of Maharashtra. A team of 7 researchers consisting of 6 investigators and one supervisor conducted the data collection. The interviews were conducted in Hindi. Each interview lasted for about 15 to 20 minutes. Prior to data collection, the investigators and supervisor participated in training on assigning unique identifiers to households and participants, approaching household members, best practices for phone surveys, protocols for multiple contacts, and collecting informed consent for participation. Investigators were provided with a detailed understanding of the interview process and questions, including many mock sessions during their training. The phone numbers of the residents living in the implementation area were available in SNEHA's records and were shared with the surveyors. Prior to conducting the interview, informed consent was obtained from respondents.

The survey included 38 questions adopted from WHO's "Survey Tool and Guidance: Rapid, Simple, Flexible Behavioral Insights on COVID-19" and a survey tool used by Austrian et al. (2020) which was used to assess COVID-19-related knowledge, attitudes and practices of households in informal settlements in Nairobi, Kenya. The survey included sections on demographic information, sources of COVID-19 information, knowledge and awareness of COVID-19 symptoms, preventive behaviors,



perceived risk of the disease, fears and worries during the pandemic and awareness, uptake and perception related to the COVID-19 vaccine. The questions asked were similar for both surveys. The present analysis mainly focuses on the second survey conducted from April 2021 to May 2021 during the second wave of COVID-19.

## Data Analysis

STATA (Version 14) was used for analysis. Survey responses were analyzed as frequencies and percentages. Responses were examined among all respondents and by gender (male and female; 'other' gender not included due to small sample size) and age group (categorized based on the distribution as <35 (younger) and >=35 years (older)). Chi-square tests were used to evaluate the statistical significance of differences in responses to survey questions by sex and age; Fisher's test was used for cell counts under five. A p-value of less than 0.05 was considered statistically significant. Changes in responses on COVID-19 information, knowledge and behaviors between the first and second surveys were also examined. No adjustments were made for multiple comparisons.

### Results

Demographic characteristics of the survey respondents are presented in Table 1. A total of 460 persons were surveyed, of which 50% were below the age of 35 and 49% were females.



Demographic Details	n (%)
Age (years)	
<20	19 (4)
20-34	211 (46)
35-49	187 (41)
50-64	35 (8)
≥65	8 (2)
Gender	
Female	226 (49)
Male	233 (51)
Others	1 (0.2)
Sanitation facilities	
Shared toilet	359 (78)
Private toilet	100 (22)
Other	1 (0.2)
Average household size	5

Table 1. Socio-demographic details of survey respondents during the COVID-19 among Dharavi residents, Mumbai, India (N=460)

## Knowledge

### Sources of information and trust on sources of information

Table 2 shows that the most common source of COVID-19 pandemic-related information was television (94%) followed by family (70%) and community health workers (CHW) (58%). CHWs included community health workers and community-based volunteers affiliated with the government and non-governmental organizations. More men (58%) reported social media as a source of information than women (48%) (p<0.05). In addition, 58% of the younger age group reported social media as a source of information compared to 48% of the older group. CHWs and doctors were the most trusted sources of information (97%). Other sources, such as public announcements and posters, were more trusted than television and social media but were not



widely reported as common sources of information. There was a gender difference in social media (80% men versus 72% women) as trusted sources of information, but this was not statistically significant.

Information Sources and	Total	Mala	Fomalo	~25	<b>\_25</b>						
				(1, 220)	/// 222)						
Trust	(N=460)	(N=233)	(N=226)	(N=230)	(N=230)						
Source of information											
Television	431 (94)	222 (95)	208 (92)	216 (94)	215 (94)						
Social media	244 (53)	135 (58) <sup>b</sup>	109 (48) <sup>b</sup>	134 (58) <sup>c</sup>	110 (48) <sup>c</sup>						
WhatsApp	224 (49)	121 (52)	103 (46)	119 (52)	105 (46)						
Family	322 (70)	162 (70)	160 (71)	168 (73)	154 (67)						
CHWs	265 (58)	129 (55)	135 (60)	139 (60)	126 (55)						
Doctors	117 (25)	61 (26)	56 (25)	60 (26)	57 (25)						
Posters	155 (34)	83 (36)	72 (32)	76 (33)	79 (34)						
Public announcement	64 (14)	43 (19) <sup>b</sup>	21 (9) <sup>b</sup>	32 (14)	32 (14)						
	Trust in so	ources of infor	mation <sup>a</sup>								
Television	383 (89)	191 (86)	191 (92)	194 (90)	189 (88)						
Social media	186 (76)	108 (80)	78 (72)	101 (75)	85 (77)						
WhatsApp	163 (73)	84 (69)	79 (77)	86 (72)	77 (73)						
Family	282 (88)	142 (88)	140 (88)	150 (89)	132 (86)						
CHWs	256 (97)	122 (95)	133 (99)	136 (98)	120 (95)						
Doctors	113 (97)	60 (98)	53 (95)	57 (95)	56 (98)						
Posters	140 (90)	70 (84) <sup>b</sup>	70 (97) <sup>b</sup>	70 (92)	70 (89)						
Public announcement	58 (91)	37 (86)	21 (100)	29 (91)	29 (91)						

Table 2. Sources of information and trust on sources during the COVID-19 pandemic among Dharav
residents, Mumbai, India

Note: Numbers shown in the cells are n (%).

 $^{\circ}$  percent calculated among those who are users of the source of information (for example: 383/431 for television users =89%.

<sup>b</sup> statistically significant (p<0.05) difference between gender

<sup>c</sup> statistically significant (p<0.05) difference between age groups

### COVID-19 awareness: transmission, symptoms and preventive measures

Seventy-eight percent of respondents knew that COVID-19 could spread through respiratory droplets, and 62% were aware of its spread through an infected person (Table 3). Awareness of fever and dry cough as COVID-19 symptoms was over 90% and was similar among men and women and both age groups. Awareness of less common symptoms, such as loss of taste, fatigue, chest pain, etc., was reported by 64% respondents on average, with a significant difference between



younger (69%) and older (59%) respondents. Awareness of handwashing as a COVID-19 prevention measure was universal. Most of the respondents reported that social distancing (87%) and wearing masks (95%) are COVID-19 prevention measures. Avoiding contact with infected persons (13%) and maintaining respiratory etiquette (17%) were lesser-known preventive measures (Table 3).

Iransmission,	lotal	Male	Female	<35	>=35
Symptoms and	(N=460)	(N=233)	(N=226)	(N=230)	(N=230)
Preventive Measures					
	T	ransmission/S	pread		
Droplet	357 (78)	189 (81)	167 (74)	190 (83) <sup>c</sup>	167 (73) <sup>c</sup>
Airborne	114 (25)	57 (25)	56 (25)	57 (25)	57 (25)
Infected person	285 (62)	148 (64)	136 (60)	151 (66)	134 (58)
		Symptoms	5		
Fever	440 (96)	227 (97)	212 (94)	222 (97)	218 (95)
Dry cough	419 (91)	214 (92)	204 (90)	211 (92)	208 (90)
Breathing difficulty	325 (71)	165 (71)	159 (70)	165 (72)	160 (70)
Aches and pains	194 (42)	97 (42)	96 (43)	106 (46)	88 (38)
Sore throat	190 (41)	92 (40)	98 (43)	97 (42)	93 (40)
Headache	140 (30)	69 (30)	71 (31)	77 (34)	63 (27)
Runny nose	167 (36)	85 (37)	82 (36)	78 (34)	89 (39)
Uncommon symptoms (any one) <sup>a</sup>	294 (64)	150 (64)	143 (63)	159 (69) <sup>c</sup>	135 (59) <sup>c</sup>
	Р	reventive mea	isures		
Avoid direct contact with infected person	60 (13)	40 (17) <sup>b</sup>	20 (9) <sup>b</sup>	38 (17) <sup>c</sup>	22 (10) <sup>c</sup>
Respiratory etiquette	78 (17)	47 (20)	31 (14)	53 (23) <sup>c</sup>	25 (11) <sup>c</sup>
Social distancing	401 (87)	199 (85)	201 (89)	204 (89)	197 (86)
Wearing mask	436 (95)	219 (94)	216 (96)	220 (96)	216 (94)
Hand washing	458 (100)	231 (99)	226 (100)	230 (100)	228 (99)

Table 3.	Knowledge	of	COVID-19	transmission,	symptoms	and	preventive	measures	during	the
COVID-1	9 among Dha	rav	i residents.	Mumbai, India	9					

Note: Numbers shown in the cells are n (%).

<sup>a</sup> Uncommon symptoms include loss of taste, loss of speech, diarrhea, fatigue, muscle ache, chest pain and skin rash.

<sup>b</sup> statistically significant (p<0.05) difference between gender

<sup>c</sup> statistically significant (p<0.05) difference between age groups

Accuracy of information related to COVID-19 symptoms and spread (>50% correct answers) was the highest among those who reported their source of information as doctors (80%), public announcements (80%) and posters (78%), while it was the least for those who received information



from most used sources such as family (61%) and television (63%) (p<0.05). (data not shown). Awareness of helplines was low (28% average) with a significant gender difference- 38% for males and 17% for females. Those aware of COVID-19 helplines used them mainly for COVID-19 testing and food distribution (data not shown).

## Vaccine awareness and perception

Most respondents (97%) were aware of the COVID-19 vaccine (Table 4). Nearly one-fifth of the respondents (18%) reported taking the first or second dose of the COVID-19 vaccine at the time of the survey. Among those who had not taken the vaccine, 63% reported willingness to take the vaccine when made available to them, with significant gender and age differences (Table 4). More than one-third (37%) reported that they do not intend to take the vaccine or do not know whether they will take the vaccine, with a significant difference between women (46%) and men (27%). Vaccine safety (34%) and the side effects after administration (23%) emerged as major concerns related to the vaccine (data not shown).

Table	4:	COVID-19	vaccine	awareness	and	perceptions	during	the	COVID-19	among	Dharavi
reside	nts,	Mumbai, Ir	ndia								

Vaccine Awareness and	Total	Male	Female	Age <35	Age >=35
Prevention	(N=460)	(N=233)	(N=226)	(N=230)	(N=230)
Aware about the vaccine	444 (97)	227 (97)	217 (96)	218 (95) <sup>c</sup>	226 (98) <sup>c</sup>
Received vaccine	81 (18)	49 (21)	32 (14)	34 (15)	47 (20)
Intend to get the vaccine <sup>a</sup>	240 (63)	135 (73) <sup>b</sup>	105 (54) <sup>b</sup>	110 (56) <sup>c</sup>	130 (71) <sup>c</sup>
Do not intend to take the vaccine/don't know whether will take vaccine	139 (37)	49 (27) <sup>b</sup>	89 (46) <sup>b</sup>	86 (44) <sup>c</sup>	53 (29) <sup>c</sup>

Note: Numbers shown in the cells are n (%).

 $^{\rm a}$  Among those who have not received vaccine (Males N=184; Females N=194; Age<35 N=196; Age>=35 N=183)

<sup>b</sup> statistically significant (p<0.05) difference between gender

<sup>c</sup> statistically significant (p<0.05) difference between age groups

### Attitudes

Perceived risk and efficacy of preventive measures

Over fifty percent of the respondents felt they had a low risk of contracting COVID-19, while 19%



felt medium risk and 8% felt they were at high risk. Most respondents considered preventive measures very effective (48%) or somewhat effective (39%) (Table 5).

during the COVID-19 among Dharavi residents, Mumbai, India										
Degree	of	Total	Male	Female	<35	>=35				
risk/effectiveness	risk/effectiveness (N = 460) (N=233) (N=226) (N=230) (N=230)									
		Perceivea	risk of getting	g COVID-19						

Table 5. COVID-19 related attitudes of perceived risk and perceived efficacy of preventive measures

0										
risk/effectiveness	(N = 460)	(N=233)	(N=226)	(N=230)	(N=230)					
Perceived risk of getting COVID-19										
No risk at all	53 (12)	33 (14)	19 (8)	30 (13)	23 (10)					
Low Risk	250 (54)	125 (54)	125 (55)	123 (54)	127 (55)					
Medium Risk	89 (19)	47 (20)	42 (19)	46 (20)	43 (19)					
High Risk	35 (8)	12 (5)	23 (10)	17 (7)	18 (8)					
Don't Know	31 (7)	16 (7)	15 (7)	13 (6)	18 (8)					
Per	ceived efficacy	for COVID-19	preventive beha	iviors						
Very effective	222 (48)	121 (52)	101 (45)	116 (50)	106 (46)					
Somewhat effective	179 (39)	86 (37)	92 (41)	91 (40)	88 (38)					
A little or not effective at all	59 (11)	26 (11)	33 (15)	23 (10)	36 (16)					

Note: Numbers shown in the cells are n (%).

### Fear, worries and information needs during COVID-19

Over 50% of the respondents had fears related to loss of employment, than their physical (10%) or mental (4%) health. More than half of the older age group (59%) was worried about unemployment, a significant difference as compared to the younger age group (47%). As presented in Table 6, women were also significantly more worried about being unable to pay bills, the health of their loved ones and restricted access to food supplies compared to men. Thirty-five percent of respondents reported no worries regarding the pandemic and related restrictions, with a significant gender difference (40% men versus 30% women).

Sixty-nine percent of men did not want any more information regarding the pandemic and related restrictions compared to 54% women, which was statistically significant. In addition, there were statistically significant differences in the nature of the information required- more women than men wanted information regarding vaccination, the economic impact and availability of groceries.



## Table 6. Fear, worries and information needs during the COVID-19 pandemic among Dharavi residents, Mumbai, India

Fears, Worries and Information Needs	Total (N=460)	Male (N=233)	Female (N=226)	<35 (N=230)	>=35 (N=230)				
<i>Fear and worries</i>									
No worries	162 (35)	94 (40) <sup>a</sup>	68 (30) <sup>a</sup>	90 (39)	72 (31)				
Becoming unemployed	245 (53)	122 (52)	122 (54)	109 (47) <sup>b</sup>	136 (59) <sup>b</sup>				
Not being able to pay bills	129 (28)	50 (22) <sup>a</sup>	78 (35) ª	65 (28)	64 (28)				
Health of your loved ones	78 (17)	28 (12) ª	49 (22) <sup>a</sup>	40 (17)	38 (17)				
Restricted access to food supplies	92 (20)	32 (14) <sup>a</sup>	59 (26) ª	43 (19)	49 (21)				
Restricted liberty of movement	57 (12)	26 (11)	30 (13)	28 (12)	29 (13)				
Personal mental health	17 (4)	9 (4)	8 (4)	5 (2)	12 (5)				
Personal physical health	46 (10)	18 (8)	27 (12)	16 (7) <sup>b</sup>	30 (13) <sup>b</sup>				
	Info	rmation need	s						
Don't want any more information	282 (61)	160 (69) ª	121 (54) <sup>a</sup>	143 (62)	139 (60)				
Information on protecting myself and my family against COVID-19	44 (10)	19 (8)	25 (11)	23 (10)	21 (9)				
Information on vaccination	91 (20)	34 (15) <sup>a</sup>	57 (25) <sup>a</sup>	52 (23)	39 (17)				
Information on the economic impact of the pandemic	33 (7)	9 (4) ª	24 (11) ª	17 (7)	16 (7)				
Information about availability of ration/groceries	33 (7)	11 (5) ª	22 (10) ª	11 (5) <sup>b</sup>	22 (10) <sup>b</sup>				

Note: Numbers shown in the cells are n (%).

<sup>a</sup> statistically significant (p<0.05) difference between gender

<sup>b</sup> statistically significant (p<0.05) difference between age groups

We analyzed whether there were differences in information needs and fears based on the source of COVID-19 information of the respondents; however, the differences were not significant (data not shown). Respondents' attitudes of not wanting more information were further compared to the accuracy of COVID-19 knowledge. It was found that of those who did not want more information, 43% had more incorrect answers (>50%) related to COVID-19 spread and symptoms; however, the relation was not significant (data not shown).



## Practices

## Healthy/Protective Behaviors during COVID-19

A majority (>85%) of men and women and both age groups responded that they used handwashing, masks and social distancing as health-protective behaviors in the week prior to the survey (Table 7). Detailed analysis shows that while close to 90% of the respondents reported always wearing a mask while going out in the past week, less than 30% of men and women felt the need to wear masks while going to the market, visiting common toilets, walking on the street, in public transport or at their workplace. Similarly, while more than 90% reported cleaning/washing their hands with soap/sanitizer before eating, and after visiting the toilet, less than 30% reported handwashing before/after entering the workspace or before leaving the house, and less than 15% reported washing hands after coughing, sneezing, after changing a baby's diaper or after caring for a sick person (Table 7).

Preventive	Total	Male	Female	<35	>=35					
Practices/Behaviors	(N=460)	(N=233)	(N=226)	(N=230)	(N=230)					
Preventive practices in the past week										
Handwashing	450 (98)	223 (96) <sup>b</sup>	226 (100) <sup>b</sup>	225 (98)	225 (98)					
Use of mask	441 (96)	223 (96)	217 (96)	218 (95)	223 (97)					
Social distancing	399 (87)	199 (85)	199 (88)	201 (87)	198 (86)					
Disinfecting surfaces	95 (21)	41 (18)	54 (24)	53 (23)	42 (18)					
In the past	week have you	i worn a mask	when leaving	home <sup> ь</sup>						
Never	17 (4)	3 (1)	14 (6)	11 (5)	6 (3)					
Always	407 (89)	223 (96)	183 (81)	196 (85)	211 (92)					
Sometimes	36 (8)	7 (3)	29 (13)	23 (10)	13 (6)					
Wh	ere do you thi	nk you should	wear a mask							
Everywhere outside my	336 (73)	179 (77)	156 (69)	167 (73)	169 (74)					
house										
In	129 (28)	57 (25)	72 (32)	64 (28)	65 (28)					
supermarkets/markets/shop										
S										
While using public toilets	114 (25)	55 (24)	59 (26)	54 (24)	60 (26)					
While walking on the streets	70 (15)	37 (16)	33 (15)	39 (17)	31 (14)					
When using public transport	88 (19)	49 (21)	39 (17)	46 (20)	42 (18)					
At workplace	31 (7)	20 (9)	11 (5)	15 (7)	16 (7)					

Table 7. COVID-19 protective behaviors (exhibited in the week prior to the survey) during the COVID-19 pandemic among Dharavi residents, Mumbai, India



Type of mask used in the past week										
Reusable cloth mask	423 (92)	218 (94)	204 (90)	210 (91)	213 (93)					
Disposable medical mask	11 (2)	5 (2)	6 (3)	7 (3)	4 (2)					
Medical surgical mask (N95)	24 (5)	17 (7) <sup>b</sup>	7 (3) <sup>b</sup>	17 (7) <sup>c</sup>	7 (3) <sup>c</sup>					
Scarf <sup>a</sup>	11 (2)	2 (0.9) <sup>b</sup>	9 (4) <sup>b</sup>	4 (2)	7 (3)					
Frequency of cleaning reusable mask										
How often was the reusable	Total	Male	Female	<35	>35					
mask washed in the past one week?	(N=423)	(N=218)	(N=204)	(N= 210)	(N=213)					
After every use	392 (93)	203 (93)	188 (92)	200 (95) <sup>c</sup>	192 (90) <sup>c</sup>					
After 2-3 uses	31 (7)	15 (7)	16 (8)	10 (5) <sup>c</sup>	21 (10) <sup>c</sup>					
Handwashing and Hygiene routine										
Washed hands with soap/used sanitizer	Total (N=460)	Male (N = 233)	Female (N = 226)	<35 (N = 227)	>=35 (N = 149)					
Before preparing food	192 (42)	30 (13) <sup>b</sup>	162 (72) <sup>b</sup>	110 (48) <sup>c</sup>	82 (36) <sup>c</sup>					
Before eating	428 (93)	214 (92)	213 (94)	216 (94)	212 (92)					
After using the toilet	430 (94)	213 (91)	216 (96)	210 (91)	220 (96)					
After changing a baby's diaper	61 (13)	12 (5) <sup>b</sup>	49 (22) <sup>b</sup>	43 (19) <sup>c</sup>	18 (8) <sup>c</sup>					
After coming home from a public place	341 (74)	181 (78)	160 (71)	168 (73)	173 (75)					
After coughing/sneezing	46 (10)	24 (10)	22 (10)	27 (12)	19 (8)					
Before or after caring for a sick or vulnerable person	36 (8)	15 (6)	21 (9)	25 (11) <sup>c</sup>	11 (5) °					
Before leaving the house	97 (21)	55 (24)	42 (19)	47 (20)	50 (22)					
Before entering a shop/office	73 (16)	47 (20) <sup>b</sup>	26 (12) <sup>b</sup>	43 (19)	30 (13)					
After entering a shop/office	101 (22)	60 (26) <sup>b</sup>	41 (18) <sup>b</sup>	58 (25)	43 (19)					

Note: Numbers shown in the cells are n (%).

<sup>a</sup> Scarf/mask/towel/dupatta/naqaab

 $^{\rm b}$  statistically significant (p<0.05) difference between gender

<sup>c</sup> statistically significant (p<0.05) difference between age groups

## Changes from the first to the second survey

## Sources of information for COVID-19

Television (90% in the first survey- 94% in the second survey), family (56%-70%), CHW (33%-58%) and social media (34%-53%) were common sources of information for COVID-19 in both surveys (data not shown). In both the surveys, CHWs (98%-97%) and doctors (94%-97%) continued to be



the most trusted sources of information. In addition, the level of trust increased for the most common sources- television (80%-89%), family (85%-88%) and social media (64%-76%) (data not shown).

## Knowledge

The first to second survey comparison indicates increased awareness of most symptoms (Figure 1). Seventy-eight percent of respondents reported that COVID-19 could spread through droplets in the second survey compared to 69% in the first survey. In contrast, 62% of the second survey respondents reported that it could spread from infected persons compared to 76% of the first survey respondents.

Figure 1. Change in awareness of COVID-19 spread and symptoms between the first and second surveys among Dharavi residents, Mumbai, India





## Attitudes

Unemployment (44% in the first survey-53% in the second survey) and inability to pay bills (26%-28%) were the main reasons for worry among the respondents and increased between the two surveys (Figure 2). While worries related to health of loved ones fell (26%-17%) between the two surveys Also, over one-third of the respondents expressed no worries at all in both surveys (34%-35%).





While there was an increase in the respondents requiring no further information related to COVID-19, this was more among men (9% increase) than women (4% increase) between the two surveys (data not shown).



## Practices

In both surveys, more than 80% of the respondents reported handwashing, use of masks and social distancing as measures to prevent COVID-19 in the week prior to the survey (Figure 3). The proportion of respondents wearing masks reduced marginally between the two surveys. The need for wearing masks on the street fell between the two surveys (24% in the first survey-15% in the second survey). As for handwashing, the proportion of respondents who washed their hands/sanitized before leaving their homes (29%-21%), after entering the workspace/shops (31%-22%) or before preparing food (51%-42%) fell in the second survey (Figure 3).



# Figure 3. Change in protective behaviors for COVID-19 between the first and second surveys during the COVID-19 among Dharavi residents, Mumbai, India





### Discussion

The study analyses the knowledge, attitudes and practices during the second wave of COVID-19 in the slum settlement of Dharavi, Mumbai. When the pandemic broke out in Mumbai city, the state and local governments expressed concern about increasing cases in highly dense slum settlements of the city. This led to stricter measures of tracing, tracking, testing and treating ("4T" program), which helped curb the spread of COVID-19 in Dharavi (Kaushal & Mahajan, 2021; Kudtarkar, 2021; Mirchandani & Chitrapu, 2023). However, the present results show that awareness challenges such as lack of complete information, fears and worries, and partial followance of preventive behaviors persisted, highlighting the need for better communication strategies. Using the insights from the results of this study, we offer cues for how communication strategies can be better designed and implemented in crises such as health emergencies, especially in socio-economically vulnerable settlements.

The findings emphasize various channels for crisis communication, which encompass mass media like television and social networking platforms, mid-media sources such as posters and local public announcements, and interpersonal communication (IPC) channels like information exchange within families, with doctors, and through CHWs. In our community, television and family, followed by CHWs and social media, emerged as the most frequently utilized sources of COVID-19 information, aligning with the results of prior research studies (Austrian et al., 2020; Bapaye & Bapaye, 2021; Islam et al., 2020). Our study showed that sources of information differed between different groups based on accessibility; for example, social media was used more by males and younger respondents. The primary sources of information, i.e., television and family, were less trusted than mid-media sources, i.e., posters and public announcements, while IPC, especially through government sources, was most trusted. Accuracy of responses related to COVID-19 symptoms and preventive behaviors was higher among those who trusted doctors and public announcements. They also reported fewer worries than those who accessed information through mass media such as television. This highlights two aspects to be considered for deciding sources of information for crisis communication strategies. First, there is a need for communication strategies to be designed through mediums that cater to diverse groups. Public announcements or interactions with government health workers/doctors in the local language that can be easily understood by a diverse audience are more feasible in our setting than information shared through social media



which was less accessible, especially to women and older respondents. Secondly, health-related *information must be shared through trusted sources in the community* to ensure its reliability and effectiveness, highlighted as well by other studies (Mirchandani & Chitrapu, 2023). In our case, CHWs and doctors providing information through IPC and information shared by government sources were much more trusted than the media. Health workers and volunteers were also crucial for implementing the "4T" program in Dharavi (Kaushal & Mahajan, 2021; Kudtarkar, 2021). IPC from government health workers appears to be an effective and trusted means of crisis communication. However, it is often difficult for health workers to reach out individually to large sets of populations. This can be supplemented by commonly used media with a wider and faster reach while ensuring its accuracy and reliability through information sourced and verified by the government, such as government-led advertisements on television. The need for such trusted sources of information has also been highlighted as useful in similar contexts (Austrian et al., 2020; Chaturvedi & Singh, 2021).

The study highlights that while multiple sources of information led to high levels of awareness, this did not translate into improved attitudes and practices in the population. This is because awareness was almost universal for the most common symptoms and general preventive practices without in-depth detailed information. For instance, awareness regarding the need for handwashing could have been continuation of pre-pandemic routines. Specific preventive measures such as handwashing before/after entering workplaces/shops or after caring for an infected person were rarely practiced. Similarly, while awareness of wearing masks as a preventive measure was almost universal, it was not practiced in many instances, such as wearing a mask to community toilets or workplaces. The emphasis in messaging was more on using specific terminology, like "social distancing," rather than on advising people to avoid contact with infected individuals or practice respiratory etiquette. Attitudes towards more information needed and specific practices such as handwashing before/after entering workspace/shops/home also reduced between the two surveys. Further, respondents believed highly in the efficacy of the general preventive measures, while their perceived risk of contracting the disease was low. Information received from multiple sources, belief in achieved immunity and consideration of media as overreporting and exaggerating information, as reported through our qualitative findings (Ramani et al., 2022), could have contributed to low perceived risk and attitude of not wanting any more information related to COVID-19. This shows how a lack of adequate and in-depth information



impacts attitudes and, in turn, preventive practices. It highlights the need for crisis communication strategies and *awareness messaging to provide accurate, in-depth and detailed information*. Midmedia sources such as posters and pamphlets can provide effective visual aids for detailed awareness messaging, especially when shared by trusted sources such as CHWs.

The study also found that most respondents primarily had fears related to unemployment and financial hardship more than their health, corresponding to the findings of Kuang et al. (2020) in Tamil Nadu, India. Dharavi was declared a success story since the spread of COVID-19 was contained and controlled. However, due to the loss of jobs during pandemic-related restrictions, livelihood and food security-related fears persisted and, in fact, increased between the two surveys. Information needs were focused on livelihood and food security more than health. This highlights the need to adopt context-specific and need-based communication strategies that are more holistic and multidimensional. Although COVID-19 was a health crisis, there was a need for information not just on the disease and its prevention, or of health services, but also related to other daily life functions that were disrupted due to the pandemic. The nature of awareness and information messaging thus needed to cater to community needs, such as livelihood and food insecurity, to allay fears and provide assurance. Addressing stigma, fear and discrimination also needed to be a crucial part of IPC and messaging. Context-based strategies are also crucial for improving practice/behaviors of prevention. As an example, promoting the importance of frequent handwashing may not be practical in an area where there is limited access to clean water and sanitation facilities. In such circumstances, a more effective approach could involve the government distributing hand sanitizers that do not require water.

The study thus provides information on residents' knowledge, attitudes and practices in a dense slum settlement during the second wave of the COVID-19 pandemic in Dharavi, Mumbai. Through this, it highlights several ways in which communication strategies of the government in crises such as the pandemic can be context-specific, multidimensional, focused, in-depth and trustworthy to act as more effective means of creating awareness, behavior change and allaying fears. It provides an opportunity to learn from this pandemic experience and adopt context-based and holistic response mechanisms in case of future crises/emergencies, especially for vulnerable populations.

Because we utilized a survey tool adapted from a standardized one, our findings can be compared to those in various other community settings. We were able to get an equal number of male and



female respondents across different age groups; results from this study can be considered a good representation of the community perspective by age and gender. Due to the well-established trust and relationships between SNEHA and the Dharavi community, we were able to conduct the survey telephonically, even during the second wave of the pandemic. However, the study does have some limitations. Firstly, conducting a survey during a pandemic gave rise to certain logistical issues. Due to restricted movement, we could not conduct face-to-face interviews and were limited to phone-based data collection. This may have resulted in a biased sample as we could contact only those who had a phone or those whose phones were available or reachable. Secondly, because of the increased stress levels brought on by the pandemic, we intentionally kept the questionnaire brief and did not collect detailed demographic data, including information on income, education, and occupation. This decision constrained the depth of analysis we could conduct with the data. Lastly, due to the attention on Dharavi first as a COVID-19 hotspot and later a success story, the responses may have been influenced by a social desirability bias.

In summary, even though we have moved beyond the significant challenges and vulnerabilities brought about by the COVID-19 pandemic and subsequent lockdowns, it is probable that we will encounter a similar situation again unless we glean valuable lessons from prior experiences. Through the study, we provide insight into one such learning- adopting holistic and multidimensional approaches to provide context-specific responses and information strategies that can cater to the specific needs of urban slum settlements in crises/emergencies.

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